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ABSTRACT

The transition from industrial arts to technology education is a priority in Colorado. Millions of dollars have been and will be spent to renovate industrial arts facilities and laboratories. Four Colorado middle schools have exemplary technology education programs. The Eagle Crest Technology Education Laboratory is used for both middle and high school courses. Through modular learning techniques, instructors focus on student outcomes as a necessary component of each module. Eagle Crest programs offer students analytical thinking skills, arts and humanities, citizenship skills, communication skills, environmental awareness, family living skills, health awareness, mathematical skills, science and technology, knowledge, and work skills. Delta County Schools have four model middle school technology education laboratories that provide a positive example to statewide administrators. This program provides students an opportunity to explore the world of technology and how it affects their lives. Boltz Junior High School has provided leadership on the transition to technology education. Erie Middle and Senior Schools have adopted the Lab 2000 philosophy, a process ensuring proper in-service teacher education. Wood shops are being replaced in all four programs with computer-intensive laboratories where students can experiment with the modern technological systems of communication, transportation, design, and manufacturing. Students apply the knowledge they gain to computer-simulated and real products they design, test, and produce. (Descriptions and diagrams of laboratory facilities are included for most programs.) (NLA)

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SELECTED COLORADO TECHNOLOGY EDUCATION PROGRAMS

Gene W. Gloeckner

Colorado State University
Fort Collins, Colorado

Presentation for the Technology Education Division
American Vocational Association

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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Cincinnati, Ohio

December, 1990

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Technology education has exploded in the state of Colorado. Millions of dollars have already been allocated toward the transition of industrial arts to technology education. In addition to the millions of dollars already allocated, millions of dollars worth of plans to renovate industrial arts facilities to technology education facilities have been approved for over the next three years.

In Colorado, the exciting part about the allocation is that nearly all of the allocation has come from the local tax base, not from vocational or Title II monies. This trend clearly indicates the willingness of local school districts to actively encourage and participate in our current change.

I have chosen to share information from four middle school technology education programs. The Eagle Crest Technology Education Laboratory is used for both middle school and high school courses. A great deal of money has been allocated for the purpose of developing this laboratory. The team of instructors at Eagle Crest has been very conscious to focus on student outcomes as a necessary component of each of the modules. Ross Ericson, John McCluskey, and the coordinator, Gordon Young, have spent thousands of hours modifying modules to ensure that the modules meet student needs. This is an ongoing process that will continue over the next several years.

Delta County Schools have four middle school technology education laboratories. Without question, the technology education coordinator for Delta County, Mike Neden, had a significant impact not only on his school district, but on the entire state of Colorado. Mike has brought to Colorado the idea behind the Pittsburg, Kansas program. He has modified and updated the program and has provided administrators with an example of what technology education can be. I believe that this working example has stimulated many districts throughout the state of Colorado to allocate funds from their tax bases to support technology education.

Boltz Junior High School is the third technology education middle school program that I have chosen to highlight. The teacher, Tom Crumbaker-Smith, student taught under Brad Thode in Idaho and has brought many of Brad Thode's ideas to Boltz Junior High. Tom is a leader in the Poudre R-1 School District and has provided a great deal of leadership in the state of Colorado on the transition to technology education.

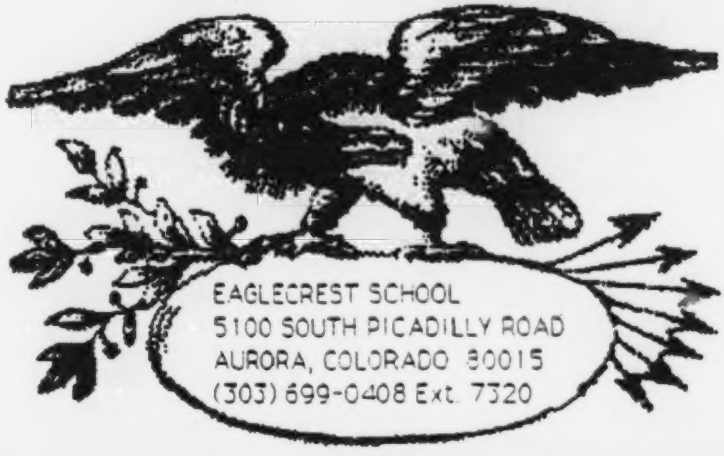
The last program I have chosen to highlight is Erie Middle/Senior School. Erie Middle School has adopted the Lab 2000 philosophy. Perhaps one of the largest contributions of the Erie Middle School system is the process that they are using to ensure that teachers in the district are properly inserviced. They have established one lab and they are using this year as a training period for teachers and will implement additional laboratories over the next two years in each of the St. Vrain schools.

If you have additional questions about any of these schools, I suggest that you contact the individual's name indicated on each of the packets or contact Gene Gloeckner at the Department of Industrial Sciences, Colorado State University, 303/491-7661.

EAGLECREST

TECHNOLOGY EDUCATION

EDUCATION FOR FUTURE LEADERS IN TECHNOLOGY



Gordon Young Technology Education Department Coordinator

CLASSROOMS OF THE 21ST CENTURY

OMNI OCTOBER 1989

The twenty-first century classroom will resemble a high-tech training center with workstations at every desk. Students will generally come and go at their leisure engaging in self-guided study, hands-on learning, and in small groups. When they think they have mastered the material, they will sign up for tests and demonstrate their knowledge, if they pass, they will move on.

Instead of using encyclopedias, Americans of the twenty-first century will tap something called hypermedia: a highly sophisticated computer design that will link databases and make them accessible to the user. People using this powerful tool will be able to scan a document, and click a cursor on a word and see volumes of information on that subject. The user will be able to continue this way indefinitly, following his curiosity from one knowledge case to another. For instance, the user might go from the Civil War to Abraham Lincoln's hat to hats throughout history and on and on. More advanced forms of hypermedia will produce sound, images, and videotapes. Hypermedia words, sound and images will be accessible through a national database, enabling the average person to access the sum of the nation's knowledge through his home computer. Be it visual or normal hypermedia will adapt to each user's style and bring information in a way the user can best understand.

Every American home will have a high-definition television, a high-tech, digital television with pictures as clear as those seen in Hollywood motion pictures. Because television will have computers inside them, many people will use the units as the main source in their homes to communicate with databases and news services. In addition the television's computer can be used to control home systems such as heating and cooling.

Technology Education - *What is it ?*

Technology is :

> "the application of human knowledge to do human work"
>
> "the systematic study of techniques for making and doing things"
>
> "the application of knowledge, tools, and skills to solve problems and to extend human capabilities"

Technology seems to have its own definition in almost every educational institution and industry. Many of the definitions are similar and it seems everyone has a favorite. In an effort to identify the essential elements of a well rounded and complete technology education program, the Eaglecrest Department of Technology Education and the Colorado Industrial Arts/Technology Education Association has elected to incorporate all of the above definitions in our description of what Technology is. We have defined technology as :

> The study of the application of knowledge, creativity, and resources to solve problems and to extend human potential.

Technology and Change:

Almost daily we see the impact of technology in our daily lives, and it has transformed almost everything we do. Eighty percent of the technology we know today has been developed during the last fifty years. Our communications systems have advanced to the point at which hundreds of conversations can take place over a line the size of a human hair at the same time through our advancements in laser technology and fiber optics. We are able to send messages around the world in seconds with our work on satellite communications systems. And we find robots assembling automobiles, delicate watches, and even doing surgery with

fewer errors and more productivity then if done by the human hand. The field of medicine has advanced to a point where we can now replace different parts of the body with man made parts, the deaf are now finding it possible to hear, people in wheel chairs are finding ways to walk, and our surgeons are using lasers to do delicate operations that could not be done before. Our transportation systems will take us to the moon or around the world in just a few hours. We even have aircraft program to operate on vocal commands from the pilot. And computers tell us the car door is ajar, control the heat in our house, allow us to access a variety of information systems, file our yearly taxes and even entertain us. And along with the machines that have made our lives easier, we now find products made from a variety of new and different materials. Plastic is used to cook our meals and even serve as a material for manufacturing automobile engines. New metallic alloys are finding their way into the market place because they are stronger and more efficient. And composite materials now make it possible for us to build and do things we couldn't do before.

Technology is conceived by inventors and planners, developed by entrepreneurs, and implemented by societies. Technological changes have made it necessary to educate our youth on current and future trends. Schools and school districts throughout the United States are now faced with the challenge of identifying and teaching various technologies to all students involved in the educational process.

Traditional Industrial Arts programs have provided students with useful skills for many years, but these programs have now become too narrow for today's learner. Technology has made it necessary to expand and update curricula. Today's students need to be introduced to the technologies that are available to them and understand how different fields of technology interact with human social systems and values. At the same time, they need to realize the value of their academic education, and how it fits into their future careers. Students need opportunities to explore areas that will allow them to succeed in today's technical world and help them develop positive attitudes about technology and its impact on society .

At Eaglecrest it is our goal to not only provide our students with these skills, but to also provide them with the skills necessary to be tomorrow's leaders. As we develop our curriculum we will make every effort to provide students with:

- the technologies needed to help them become technologically literate and able to meet the needs of the 21st century.

- activities that will help them develop a systems based approach to solving problems.

- the knowledge to use technology wisely and to realize its impact on people and our environment.

- an awareness of various careers related to each of the technologies they are introduced to.

- an integrated education, that shows them the need and value of mathematics, science, English, and social studies in the problem solving process and how their applications fit into today's technical world.

- experiences that will help them communicate, solve problems, think creatively and make decisions.

- activities that will encourage them to look beyond today and into the future.

- experiences that will teach them to use various pieces of equipment and to become well informed consumers.

- activities and problems that will help them develop good skills for employment, and prepare them to become responsible citizens for the 21st century.

- competencies needed to help prepare them for more technical professions and higher education.

- experiences that will help them develop and improve individual self esteem.

- the information needed to help prepare them to be designers, engineers, and entrepreneurs that can maintain a prosperous economy.

- an education that will encourage them to enjoy learning and to understand its importance.

Every effort will be made to address the needs of **all** students and to expose them to a wide variety of possible career opportunities. We will challenge students to reach their full potential, and to use their knowledge, experiences, and available equipment to solve problems. These experiences may not always require the need to use the very best equipment, or the state of the art technology. It is necessary for them to use their minds and what they have to work with, to reach their final solution. For example, we often throw away items or articles that can be used for other purposes. The challenge is to find a way to use the things we waste to serve other purposes, such as providing power for electricity, building our building or ???????

The Eaglecrest Technology Delivery System

The breadth and depth of today's technology makes it difficult to address all areas of technology using the traditional classroom approach. In an effort to expand curricula Technology Education programs throughout the United States have abandoned the traditional classroom method of instruction, and have adopted a more efficient model. This model, known as Modular Learning, can provide students and their instructors with all the essential elements needed to teach a well rounded Technology Education program.

The Eaglecrest Technology Education department will offer students twenty three different modules to choose from. Each module provided in the Explorations in Technology program will provide students with a ten day unit of instruction. Following each unit of instruction, students will rotate and begin a new unit. Each of these modules will make use of current technologies to assist each student in the educational process. Students can expect to use the computer, VCR, CD-ROM, interactive video, and other technologically related hardware and software programs to assist them in the educational process. The activities offered in each module will provide each student the option to learn at his/her own pace. And each student will be encouraged to pursue those areas of greatest interest, as far and as deep as they choose. Current modules being developed for the Explorations in Technology program include topics such as Laser Technology, Satellite Communications, Radio, Television, Robotics, Computer Aided Manufacturing (CAM), Computer Aided Design and Drafting (CADD), Table Top Publishing, and Space Technology. All of the modules will address careers related to that particular area of study, and provide students with activities and problems that encourage creativity, problem solving and decision making skills.

EXPLORATIONS IN TECHNOLOGY MODULES

FUTURE AREAS OF EXPLORATION

1. Introduction to Computers
    a. Wordprocessing
    b. CD ROM
    c. Hyper Card
    d. Animation
    e. Computer Care
    f. Computer Disk Care
    g. Graphics
    h. Computer Aided Drafting & Design
    i. Scanners
    j. Printers

2. Robotics and Automated Systems

3. Laser Technology
    a. Holography
    b. Fiber Optics
    c. Audio/Visual Transmission

4. Satellite Communications

5. Drafting
    a. Computer Aided Drafting & Design
    b. Universal Language of Industry

6. Computer Aided Manufacturing (CAM)

7. Aviation Technology
    a. Theory of Flight
    b. Careers and Occupations

8. Space Technology
    a. Space Shuttle
    b. Space Stations
    c. NASA
    d. Astronauts
    e. International Students In Space Symposium

9. Alternate Energy
    a. Solar
    b. Wind
    c. Photovoltaics
    d. Geothermal
    e. Nuclear

10. Radio (Audio Communications)

11. Television (Visual Communications)

12. Electricity

13. Electronics

14. Biotechnology
    a. Biochemistry
    b. Bioelectronics
    c. Medicine
    d. Genetics
    e. Prosthesis Technology
    f. Hydoponics
    g. Data Analysis
    h. Wellness and Nutrition
    i. Agua Culture

15. Desk Top Publishing

16. Photography

17. Printing Processes

18. Engineering and Structures Technology

19. Fluid Systems

20. Pneumatic Systems

21. Mechanical Systems

22. Internal Combustion Engines
    a. Alternate Fuels
    b. Operation
    c. Fuel Injection

23. Other Transportation Systems
    a. Conveyor Systems
    b. Elevators
    c. Escalators
    d. Transmission Lines
    e. Pipe Lines
    f. Air, Land, Sea

24. Audio Digitizing/Synthesizing

25. Materials/Processes/Uses
    a. Woods
    b. Metals
    c. Plastics
    d. Composites
    e. Ceramics

26. Manufacturing Processes
    a. Computer Aided Manufacturing
    b. Mass Production
    c. Entrepreneurship

27. Construction Processes

28. Weather Technology

29. Impacts of Technology

30. Life Skills
    a. Home Maintenance
    b. Vehicle Maintenance
    c. Budget/records/taxes/checking
    d. Family living and planning

31. Automotive Systems

32. Career Exploration
    a. Education
    b. Career related fields
    c. Colleges and Universities
    d. Resumes
    e. Interviews

33. Invention/Innovation
    a. Problem Solving Activities
    b. Critical Thinking Skills
    c. Creativity
    d. Product Design & Development

In addition to the modules offered for the Explorations in Technology program the Technology Education Department will also offer Applications in Technology and Manufacturing, Technical Drawing, Industrial Design, Architectural Drawing, and various Independent Study programs. While it may be necessary to use some of the more traditional methods of instruction in these classes, each of these programs will make use of current and up to date technologies in the instructional process.

Applications in Technology and Manufacturing:

In an effort to meet the needs of today and tomorrow, today's manufacturing industry has adopted several new materials and processes. We can now find machines doing many of the tasks once done by hand. Applications in Technology and Manufacturing will introduce students to the materials, tools, and processes now used in today's industry. While in class, students will learn to use tools and machinery safely, and apply these skills in the manufacturing process with various materials and manufacturing processes. Students will explore processes such as injection molding, vacuum forming, robotics, and computer numerical control systems.

Technical Communications :

Technical Drawing, Industrial Design, and Architectural Technology:

These courses will teach students to apply the language of industry as they develop a variety of technical drawings. Each area of instruction is designed to give students a variety of industrial experiences as they relate to the drafting industry. In all areas of instruction, students will develop skills using drafting tools and equipment related to each specialized area of industry, and will make use of the computer for computer aided drafting and design CADD. Each of these programs will encourage students to work in teams to solve various problems using the knowledge they develop in each course.

What does Technology Education have to offer students ?

Analytical Thinking Skills

- Each student will be taught to solve problems, through the use of practical application.
- Each student will examine the benefits and risks of implementing technology.
- And students will analyze personal characteristics and determine their educational and vocational implications.

Arts and Humanities

- Each student will be taught to realize his/her own creative potential.
- Each student will be provided with experiences that can help them develop an understanding for quality, design and workmanship
- Each student will explore vocational activities relating to the arts and humanities.
- And each student will be given opportunities to evaluate the impact of technology on the quality of life.

Citizenship Skills

- Each student will be allowed to develop his/her own leadership potential
- Each student will be given opportunities to apply and understand parliamentary procedure.
- Each student will be taught about management and the organization of industrial enterprises.
- And each student will be given experiences that will teach them how to function in a democratic society.

Communications Skills

- Each student will be provided with experiences that will teach him/her to communicate intelligently about technology and industry and its social, cultural, and environmental impact.
- Each student will be provided with experiences that will help them interpret the language of industry and technology.
- Each student will be taught to listen, speak, read, write and visualize in each content area of technology education.
- Each student will be taught to draw artistic and technical images using technology and manual skills.
- Each student will be taught to follow directions.
- Each student will be taught how to access information using today's technology.

Environmental Awareness

- Each student will be given the opportunity to apply and understand the need for conservation skills.
- Each student will be taught to utilize raw materials appropriately.
- Each student will be provided with experiences that will help them assess the impact of technology on the environment.

Family Living Skills

- Each student will be taught how to interact with technological products and the people using it.
- Each student will be taught how to perform home maintenance tasks.
- Each student will be taught good consumer skills.
- And each student will learn to select appropriate leisure time activities.

Health Awareness

- Each student will be taught to develop good attitudes, knowledge and habits relating to personal and environmental safety.
- Each student will be provided with experiences to help them understand the potential impact of technological safety on the world.

Mathematics Skills

- Each student will be taught to apply mathematical tools to the solution of practical problems.
- Each student will be provided with experiences that can help them understand and utilize various measurement systems.
- And each student will be taught to use mathematical calculations in the problem solving process.

Science and Technology Knowledge

- Each student will be taught the relationship between technology and science.
- Each student will be given experiences which reinforce scientific concepts and principles through practical applications.
- Each student will be provided with experiences to help them understand and utilize communication, manufacturing, construction, energy, power and transportation systems.
- Each student will be provided with experiences that can help them assess technology of the past and present.
- Each student will be challenged with activities to help them forecast and prepare for future technologies.

- Each student will be encouraged to pursue the correct technological method of problem solving.
- Each student will be exposed to experiences involving the application of computer science and technology.

Improved Self-Esteem

- Each student will experience pride in the quality of their work.
- Each student will be provided with experiences that can help them develop interests, values, knowledge, and motor skills related to life and careers.
- Each student will be provided with experiences that can ensure student success and help them realize his/her worth to society.

Gain an Understanding of Others

- Each student will be taught to interact effectively with others locally, nationally, and internationally.
- Each student will be provided with experiences to help them understand the importance of others in our social environment.
- Each student will be taught to realize the effects of technology on societies and cultures.

Work Skills and Knowledge

- Each student will be provided with exploration experiences allowing them to explore careers in communications, manufacturing, construction, energy, power and transportation.
- Each student will be taught to understand their talents and interests related to his/her potential.
- Each student will be provided with experiences that can help them develop basic skills relating to technology and associated careers.
- And each student will be taught to be flexible and responsive to technological changes in the work environment.

Explorations in Technology
Delta County Joint School District
Technology Education Programs

Introduction:

The purpose of this project is to develop a Technology Education curriculum for the middle and secondary level student. This will include the designing of new lab facilities, teaching methodologies and student management systems. The content of this new curriculum will address the broad spectrum of Technology Education, with built-in flexibility, to allow for the updating of materials and content as it becomes necessary. Technology Education is for all students, and has become a vital part of the "general education" process. Education is for the future of our students and it is necessary that we, as professionals, do all that we can to address this responsibility.

This proposal is designed as a starting point for the development and implementation of a Technology Education curriculum into the middle and senior high schools of Delta County Joint School District #50.

Philosophy:

Technology and change have become synonymous. The advancement of technology into almost every aspect of our lives has left educators with the overwhelming responsibility of preparing students to live and cope with an ever-changing world. Traditional methods have served us well in the past, but the explosion of technology has left us ill-prepared to deal with this phenomenon. Technological advances now come so rapidly, that many teachers feel unprepared and threatened by these demands and changes. Leaders in Technology Education tell us that the body of knowledge is doubling every three to five years. We, in education, have traditionally been the slowest to react to change, but now we are faced with the awesome responsibility of educating students about the fastest changing aspect of our society.

Although ever-changing technologies have created problems, they have also provided the means by which this area of education can be legitimately presented. Flexibility in lab facilities and equipment, teaching methods and approaches, will allow for new and exciting learning possibilities. Change can be threatening, but it can also provide new and challenging situations, that offer meaningful and realistic experiences for both students and teachers. This basic philosophy provides a basis for the development and implementation of Technology Education curricula as a vital part of the educational process for all students in the district.

Middle School Program: "Explorations in Technology"

The purpose of the "Explorations in Technology" program is to provide middle level students with an exciting opportunity to "explore" the world of technology and how it affects their lives. The focus of this program is a hands-on, learning environment that will allow all students to apply and re-inforce their basic learning skills, develop interpersonal relationships with his/her peer group, and to interact with high-tech equipment and tools. Student responsibility for such things as behavior, attendance and attitude will also be emphasized as an important part of the educational process. Students will also be responsible for reading and following written and oral instructions and participating in designed activities and lessons.

Students will use self-directed instructions to "explore" sixteen different learning "modules" as they complete the "Explorations in Technology" program. This program is designed for two semesters, initially at the eighth grade level and will be required by all students.
Eight, 8-day modules will be completed each semester by teams of two students in each module. Students will be rotated each eight days, so that they will have a new partner each session.

The lab will be designed to accomodate up to sixteen students at a time and will be designed to allow for the maximum in content flexibility and teacher supervision. A flexible teaching system has been designed and is included in this proposal. The lab is also designed to accomodate other discipline areas and interdisciplinary teaching situations will be encouraged.

On the following page is a list of proposed "modules" and activities for consideration;

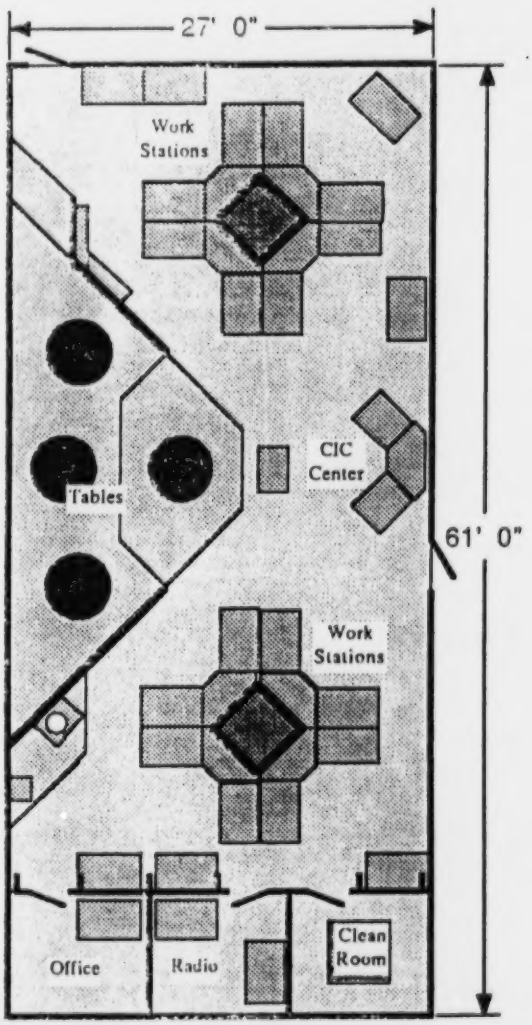
Activity Modules: *(Proposed)*

1. *Electricity:*
   - *Atomic Structure*
   - *Sources of Electricity*
   - *Magnetism*
   - *Electrical Circuitry*
   - *Soldering*
   - *Motors/Generators*
2. *Electronics:*
   - *Electronic Components*
   - *Curcuit boards/Diagrams/Schematic*
   - *Problem-solving*
3. *Applied Physics-Fluid Power/Mechanics:*
   - *Mechanical Advantage/Basic Machines*
   - *Hydraulics*
   - *Pneumatics*
4. *Applied Physics-Light, Heat, Sound and Motion:*
   - *Laser/Fiber Optics Technology*
   - *Solar Energy*
   - *Heat*
   - *Wave Technology*
5. *Research and Design:*
   - *Design Process*
   - *Specifications and Limitations*
   - *Proto-type - CO2 Dragster*
   - *Aerodynamics/Testing*
6. *Graphic Communications:*
   - *Universal Language*
   - *Sketching/Drawing/Design*
   - *Introduction to Equipment*
   - *Types of Drawings/Purposes*
   - *Computer-Aided Drafting/Design*
7. *Bio-Technology:*
   - *Prosthesis Technology*
   - *Medical Applications*
   - *Hydroponics*
   - *Data Analysis*
8. *Rocketry and Spaceflight Technology:*
   - *History of Spaceflight*
   - *Newtons Laws of Physics*
   - *NASA/Space Exploration/Future*
   - *Model Rocketry*
9. *Transportation Systems*
   - *History of Transportation*
   - *Systems/Planes/Boats/Trains*
   - *Pipelines/Other*
   - *Future Systems*
10. *Robotics Technology*
    - *Development of Robotics*
    - *Industrial/ Domestic Applications*
    - *Sensors*
    - *Programming*
11. *Desk-Top Publishing*
    - *Layout and design*
    - *Equipment/Printing Processes*
    - *Word Processing/Graphics*
12. *Radio Communications*
    - *Equipment*
    - *Transmitting/Receiving/AM/PM*
    - *Formatting/Broadcasting*
    - *Dubbing*
13. *Engineering and Structures Technology*
    - *Basic Structures Experimenting*
    - *Applied Math/Geometry*
    - *Bridges/Towers*
14. *Computer Graphics/Animation*
    - *Storyboards*
    - *Sequencing*
    - *Animation*
15. *Flight Technology*
    - *History of Flight*
    - *How an Airplane Flies*
    - *Airplane Applications*
    - *Airplane Simulators*
16. *Computer Applications*
    - *Keyboarding*
    - *Basic Programming*
    - *Word Processing/Spreadsheets*
    - *Data Base*

Group Activities
- *Technology Timeline*
- *Line Production*
- *Open Day Activities*

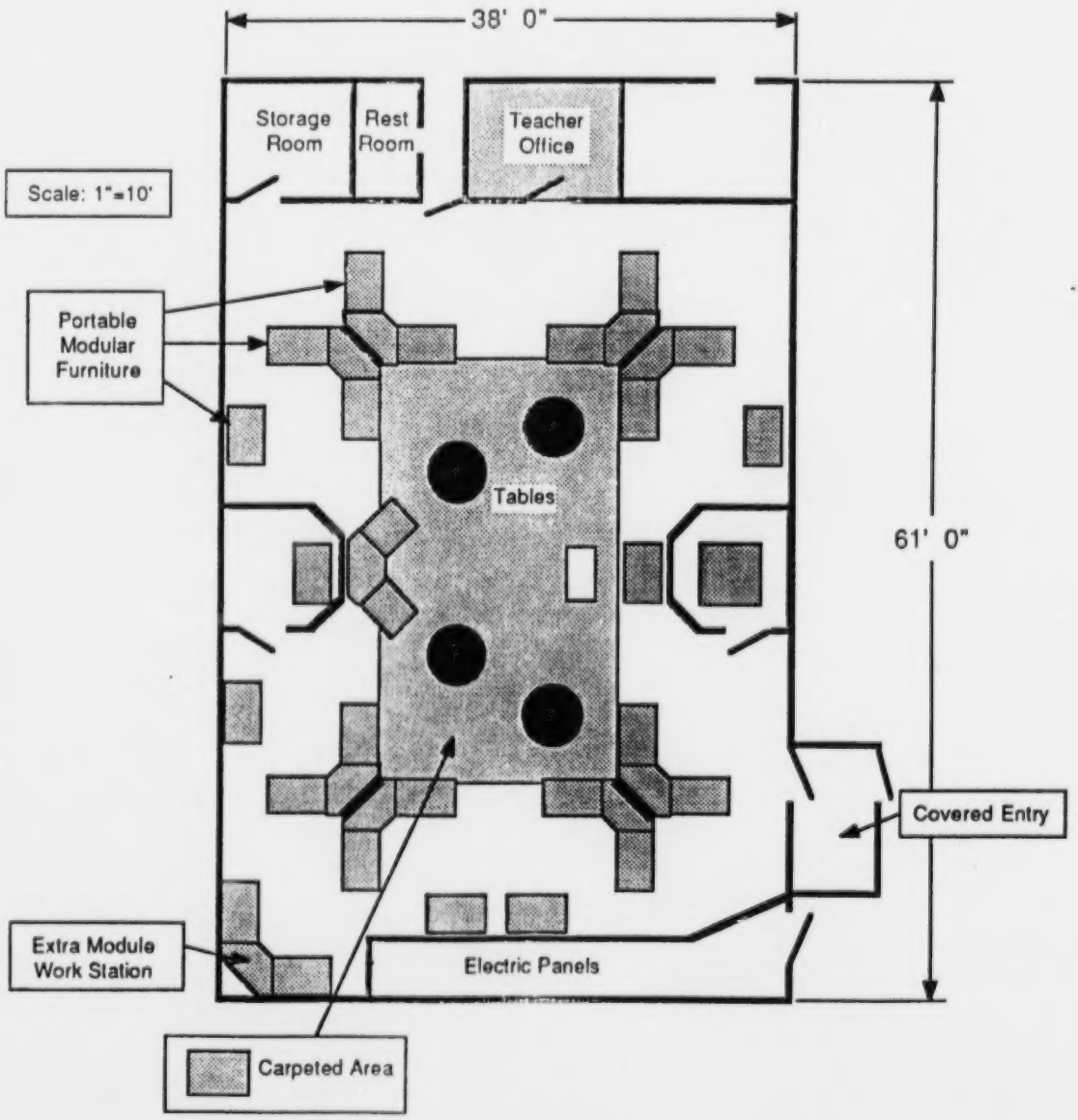
Lab Facility:

The success of the program is heavily dependent on the learning envionment that is created by the facility design and layout. The facility is an integral part of the student management system. It provides a place for each student, all necessary equipment and supplies and is easily supervised. The color and decor are also an important element of the Technology Laboratory. It should be a bright and cheery place where students want to be. On the following page is the layout of the Explorations in Technology Laboratory at Paonia Middle School in Paonia, Colorado and is the model layout for the Synergistic Technology Systems Laboratory being developed by Pitsco, Inc.



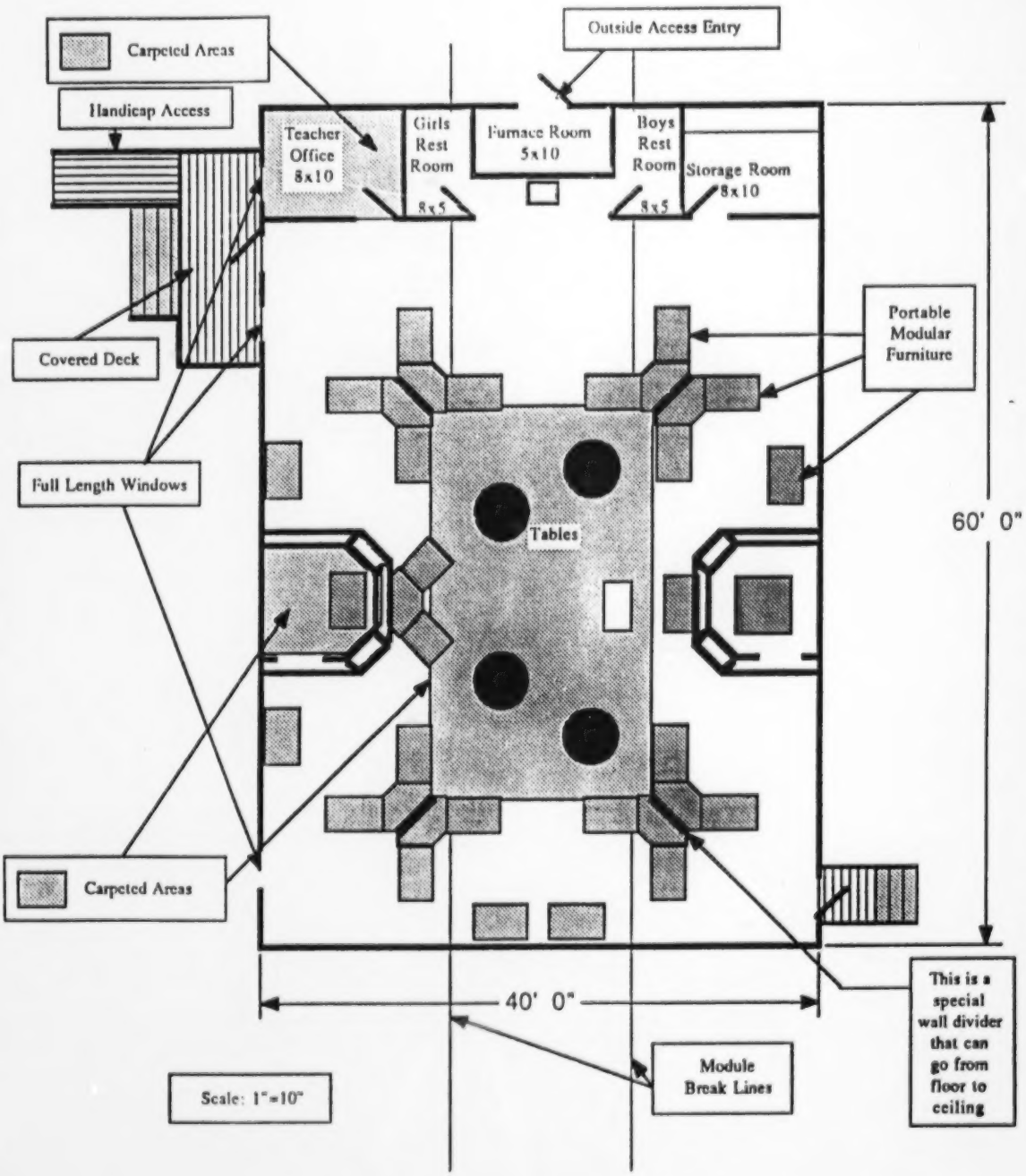
Hotchkiss Middle School
Technology Education Laboratory

PROGRAM



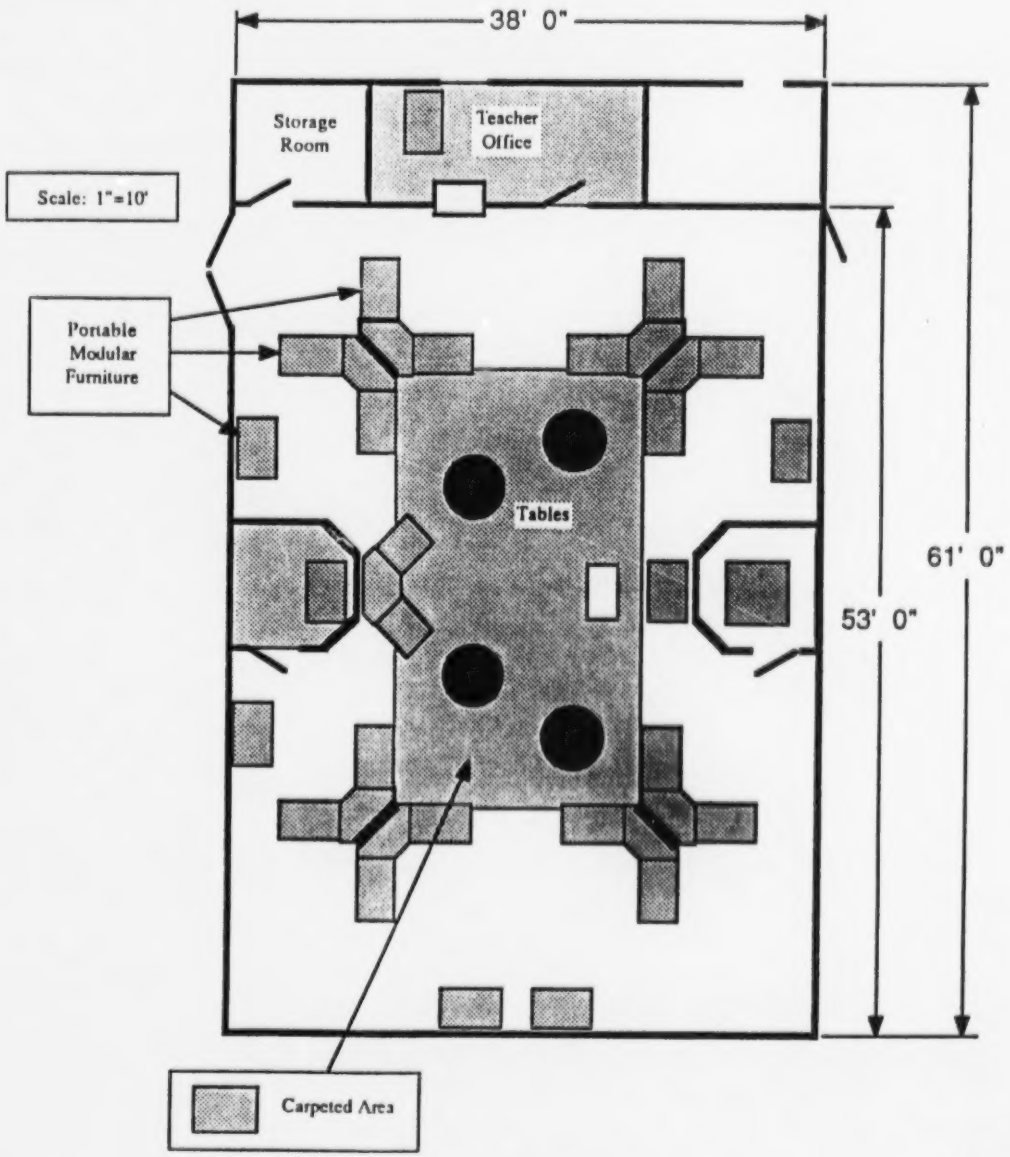
Delta Middle School
Technology Education Laboratory

PROGRAM



Cedaredge Middle School
Technology Education Laboratory

PROGRAM



Paonia Middle School
Technology Education Laboratory

Technology Education Activities

Boltz Junior High School
720 Boltz Drive
Fort Collins, Colorado 80525
Thomas Crumbaker-Smith
(303) 226-3333

The following activities were tried and tested at Boltz JHS this year (1988) and were well received by the students, faculty and administration. The activities were attempted in 7th though 9th grade with varying levels of success--which were directly related to student and **teacher** enthusiasm.

Most of the activities are fairly inexpensive to develop and, if presented in relation to Technology Education Clusters of: Communication systems, Power/Energy and Transportation, , the activities were very useful in relating technology to students.
All activities require: a "Brainstorming" session and use Problem-Solving techniques, which include: problem identification-preliminary ideas/solutions- refinement-analysis-decision-final solutidns-debugging.

Each student or group then does 8 "thumbnail" (small) sketches to stimulate ideas, with rough drawings, and final drawings done using Macintosh computers using MacPaint, MacDraw or MacDraft programs or conventional drafting methods. After the problem is solved, a final evaluation of the activity is completed.

Problem Solving /Activity Statements:

1. **Designed to Price, Fire-Mouse:** Design a mousetrap powered system to extinguish a birthday candle from three feet away. The system may not touch the candle. The design must be built using ONLY instructor supplied and "Priced" material. The system must be built for less than a pre-set value ($3 in this case) including the "cost" of the mousetrap. For example, balloons are "rare" therefore each COSTS $1.00.

2. **Paper Structures:** Design a 2.5" tall paper structure using two pieces of typing paper and glue that will support as many Barbell free weights as possible. The instructor will supply the paper and glue, plus a test stand with a vertical rod to control the stack of free weights. **NOTE:** One of Boltz's 8th grade structures held up **585 lb.** !!!!!!!!!!!!!!!!

3. Slightly Scrambled (Egg Drop): Design and build a package or structure from one sheet of 18" X 24" drafting paper that will protect one, very fresh grade "**A**" egg from breaking when dropped from a height of 35 feet onto the sidewalk. NO PARACHUTES ALLOWED! The instructor climbed up on the gymnasium roof and the instructor dropped the package, The only materials the students could use was the paper, 6" of masking tape, 3 soda straws & five staples, plus a little glue. We had a 70% success rate and lots of **FUN!**

4. Space Structure: This problem comes from **NASA.** The object of this problem is to build a tower as tall as possible, within a 30 minute time-frame. that will support a tennis bail at the top. Using only paper or plastic soda straws and straight pins as the structural members, the tower must hold the ball for 1 minute. The only tool that can be used is a pair of scissors. Our tallest was only eighteen feet,. but we saw a picture of one 24' tall!

5. Carbon Dioxide (CO-2) Dragsters: This activity was literally a **GAS**. The students loved building and racing the cars. The self motivation is incredible! All eighth-grade Dragsters had to meet all the specs supplied by Pitsco and AIASA. Nineth-graders build "open class" of any shape or style,with safe launch and operation the only concern One of our fastest cars went 62 mph! We tested the aerodynamics of each car in a plastic tube wind-tunnel using a leaf blower system as a power source. See the Pitsco catalog from P.O. Box 1328, Pittsburg, KS. 66762 for information and a small booklet on building the wind tunnel.

6. Aircraft Engineering: Using Macintosh computers and a book titled The Official Book of the 2nd Great International Paper Airplane Contest from Vintage Books and SCIENCE '86, each student had to "engineer" a paper airplane that was judged on appearance, distance of flight, and "hang time" or time of flight. This activity was really competitive amongst the kids and the instructor and CHEAP!

7. Aerodynamic Research and Development: This actvity uses a wind tunnel powered by the suction/intake of leaf blower. Students design and test the aerodynamics of airfoils and CO 2 powered cars in the wind tunnel. Students plot/graph their lift and drag calculations related to the airspeed over the objects in the tunnel.

8. Two Liter Pop Bottle Rockets: The object of this activity is to have fun and apply math, science and technology. We designed a **launch pad** that holds a 2 liter plastic pop bottle upside down on a rubber stopper. The "pad" is designed to allow our lab air compressor to pump air through the stopper into the tightly secured bottle. Each student was required to bring two bottles, one to use for "rocket" parts and the other to launch. We also had the students bring in styrofoam meat trays to use as fins or **EGG Protection Systems/Capsules.** The idea is to protect the egg during the BLAST OFF and Re-entry/Landing. The students came up with all kinds of systems to solve the problem. Using trigonommetry, we triangulated the height. One rocket reached 550 feet. Not all the eggs survived, but every one has a good time.

9. Trash Car Races: The object of this activity is to build a vehicle constructed totally out of trash or garbage. The vehicles are then "raced" down a ramp. The objective of the race is to hit and pop a balloon that is thirty feet away. One motivating factor for this activity is the balloon has a five dollar bill stuffed inside. We talk alot about recycling, waste uses, disposal etc.

10. Egg Transportation Problem: For less than $3 dollars, the students have to transport an egg from within 6 inches of the floor, and within 3 feet of an 18 inch high wall, up over the wall and down the hall as far as possible. No Sling-Shots allowed.

ADDITIONAL TECH-ED. STUDY UNITS

SUPERCONDUCTIVITY
LASERS, Fiber Optics & Holographics
ROBOTICS - String and pneumatic.
Wind Powered generators.
Rubber band/ Propeller powered cars.
Marine Transportation Boat Race
Video and Television
Electricity/Electronic
CADD and CAM
Emerging and Ultra-Technologies

The following resolution was adopted by the Board of Education on October 24, 1990.

RESOLUTION
Regarding Technology

WHEREAS, representatives of the St. Vrain Valley School District have heard from parents, business and community leaders, students, and staff members that technological skills are viewed as survival skills in an age and society which are increasingly dependent upon the efficient flow and use of information;

WHEREAS, the St. Vrain Valley School District's Board of Education recognizes that most of our society's endeavors are permeated with technology and that the forseeable future promises more technological impact on employment, entertainment, life-long learning, economics, and most other dimensions of American life;

WHEREAS, the District has developed and pursued a long range plan for technology infusion and is, at present, reviewing that plan for normal cyclical revision;

WHEREAS, the residents of the St. Vrain Valley School District can expect the best education possible for the students within the District;

BE IT THEREFORE RESOLVED that the St. Vrain Valley School District will adopt policies and procedures and undertake strategies designed to prepare our students not just for utilization of technology but for mastery of technology.

St. Vrain Valley School District
395 S. Pratt Parkway
Longmont, CO 80501

Dr. Fred Pierce, Superintendent of Schools
Dr. Mary Leiker, Assistant Superintendent of Instruction
Mr. Randy Donahoo, Supervisor of Information Technology

TECHNOLOGY

in the St. Vrain Valley School District

A Summary of Our Strategies for Technology Infusion

TECHNOLOGY EDUCATION:

A revolutionary change from industrial arts to technology education has been undertaken. Wood shops are being replaced in all middle schools and senior highs with computer-intensive labs designed to enable students to experiment with the modern technological systems of communication, transportation, design, and manufacturing. Students apply the knowledge they gain to computer-simulated and real products they design, test, and produce. The first technology education lab is already in use at Erie Jr/Sr High School. Eight more labs will be installed in 1991 and two more in 1992. That will equip all our secondary schools with one lab each, then we will return to our Career Development Center where this revolution began, and we'll advance the capabilities of that school's technology education program.

LIBRARY AUTOMATION:

In the next two years we will finish a major library automation project district-wide. Every school library/media center is being computerized. Students find books by author, title, or subject using a computer terminal. They use this same system to check out books and to return them.

At the high school and middle school levels, the system we are using also allows students to search the collections of other schools in the district. Thus, we can share our secondary school library resources district-wide. This greatly expands every student's access to information.

INSTRUCTIONAL COMPUTERS & SOFTWARE:
We have achieved a student-to-computer ratio district-wide of better than 11 to 1. This is twice as good as the national average of 22.2! Students really do have more opportunities to utilize computers in the St. Vrain Valley School District than in most other school districts. They'll find computers in labs, in library/media centers, and in numerous classrooms throughout the grade levels. In addition to having more computers than the average school district, we invest thousands of dollars in instructional and productivity software. Every school has unlimited copies of word processing, database, and spreadsheet software. Elementary schools have hundreds of titles of software which teacher teams selected and which have been linked to Core Conceptual Objectives, our adopted, outcome-based instructional objectives. Further, we have provided hundreds of hours of teacher training in the use of both hardware and software in the form of courses for university credit to one-on-one tutoring.

COMPUTERIZED WRITING LABS:
In 1990 we began a process of equipping every secondary school with a computerized writing lab in addition to the business education labs and the programming labs which have already been installed in every school. We continue to add two labs per year as we revolutionize the secondary language arts curriculum with this innovation. Already we are observing a significant improvement in the students' attitude toward the task of writing and editing.

ELECTRONIC RESEARCH TOOLS OF THE INFORMATION AGE:
Every school is equipped with information-age tools such as electronic encyclopedia, computer and modem access to useful online databases such as CARL (Colo. Alliance of Research Libraries), and direct computer linkage to major national and

international newswire services.

TEACHING & LEARNING AT A DISTANCE:

We use satellite technology for the delivery of instruction at Lyons Jr/Sr High School in order to offer a comprehensive curriculum to a very small school. We've expanded that school's course offerings by subscribing to courses taught at Oklahoma State University for small numbers of interested students. Next semester, this strategy for addressing students' needs is being expanded to Erie Jr/Sr. For several years, we have been studying the capability of sharing courses in real-time and in interactive audio and full-motion video among our own schools. We continue to believe that such a strategy will become increasingly important to public school districts in coming years.

INSTRUCTION IN PROGRAMMING LANGUAGES:

We have recently revised our computer science curriculum. At the middle school level we intend to continue to offer BASIC. At the senior high level, we are phasing out BASIC and offering Pascal. Programming is being taught on Apple IIe computers, but we are looking at alternatives such as the Macintosh or the IBM for the future.

KEYBOARDING AND BUSINESS:

Until voice recognition is perfected for low-cost computers, keyboarding will continue to be a skill which is increasingly important in the information age. We encourage teachers to begin keyboard instructions at the fourth grade, and we have an extensive program of keyboarding and business application of computers in the middle schools and high schools.

NETWORKING AND LABS:

As a part of the current building project, we intend to wire every school for integrated computer and multimedia networking. It is our goal to wire every classroom for direct access to broadcast and cable programming, in-school and in-district television, and computer networks. Also, at the completion of our building project, each school will have at least one computer lab. We want every school to have a lab as well as computers in every classroom.

Erie Technology Lab

The purpose of this lab is to help students acquire the skill and confidence needed to live and work in an ever-changing technological environment. The program focus provides concrete, hands-on, laboratory-based experiences involving material and equipment designed to make technology understandable. The student is constantly challenged to discover the underlying principles of technology and to apply them through the use of critical thinking, problem solving, and decision making skills. Scientific and technological experiments that provide opportunities for observation, analysis, and the exchange of ideas are also included. The interaction between peers and the guidance by the instructor establish a conceptual base of knowledge for each student. Having a grasp of these technology concepts serves a student throughout his or her lifetime.

Students have an opportunity to study: Robotics, Satellite Technology, Video Production, Laser Technology, Simulated Flight, Hydraulics, Rocket Technology, Mass Production, Pneumatics, Structures, Transportation Systems, Mechanical Power, Materials Testing, Thermal Technology, Computer Control and Interface, Computer Aided Design, Solar/Wind Energy, Desktop Publication, Electronics, Electricity, Hydroponics, Bio-Technology, Technical Careers, Job Seeking Skills, Telecommunications, Human Factors Engineering, Research and Development Concepts, Technical Problem Solving, Technical Math, Technical Reading, Technical Writing, Team and Group Problem Solving, Entrepreneurship, and other technological fields and concepts.

Lab Tour

Start your tour with Stop #1 and end with refreshments in the "Commons." Please sign the guest book while in the "Commons" area.

Location Start (See Map)

(1) **PERT Chart** This chart is a road map that guides students through the technology lab.

(2) ***Island #1*** Students may design cars, create airplanes, construct machines, study the history of technological developments, do computer aided drawing, etc.

(3) ***Island #2*** Students explore electricity, mechanical devices, desktop graphs, digital sound, digital video, desktop publications, and other topics.

(4) ***Island #3*** Students work with machines, pneumatics, computer aided drawing, and other activities.

(5) ***Island #4*** Students explore flight, materials analysis, structural design, light and temperature measurements, and other activities.

(6) ***Island #5*** Students combine knowledge of electricity, pneumatics, machines, and computer controlled devices to design automated systems, factories, etc.

Additional areas you may want to observe:

(A) ***Career Center*** Students can explore careers in technology; develop resumes and coversheets; refine job seeking skills, etc.

(B) ***Student Journals*** A daily record is kept by each student describing activities and observations.

(C) ***Control Center*** This is the electronic heart of the lab containing the computer network controller, laser video disk player, CK-ROM, MODEM, and other hardware used in the lab.

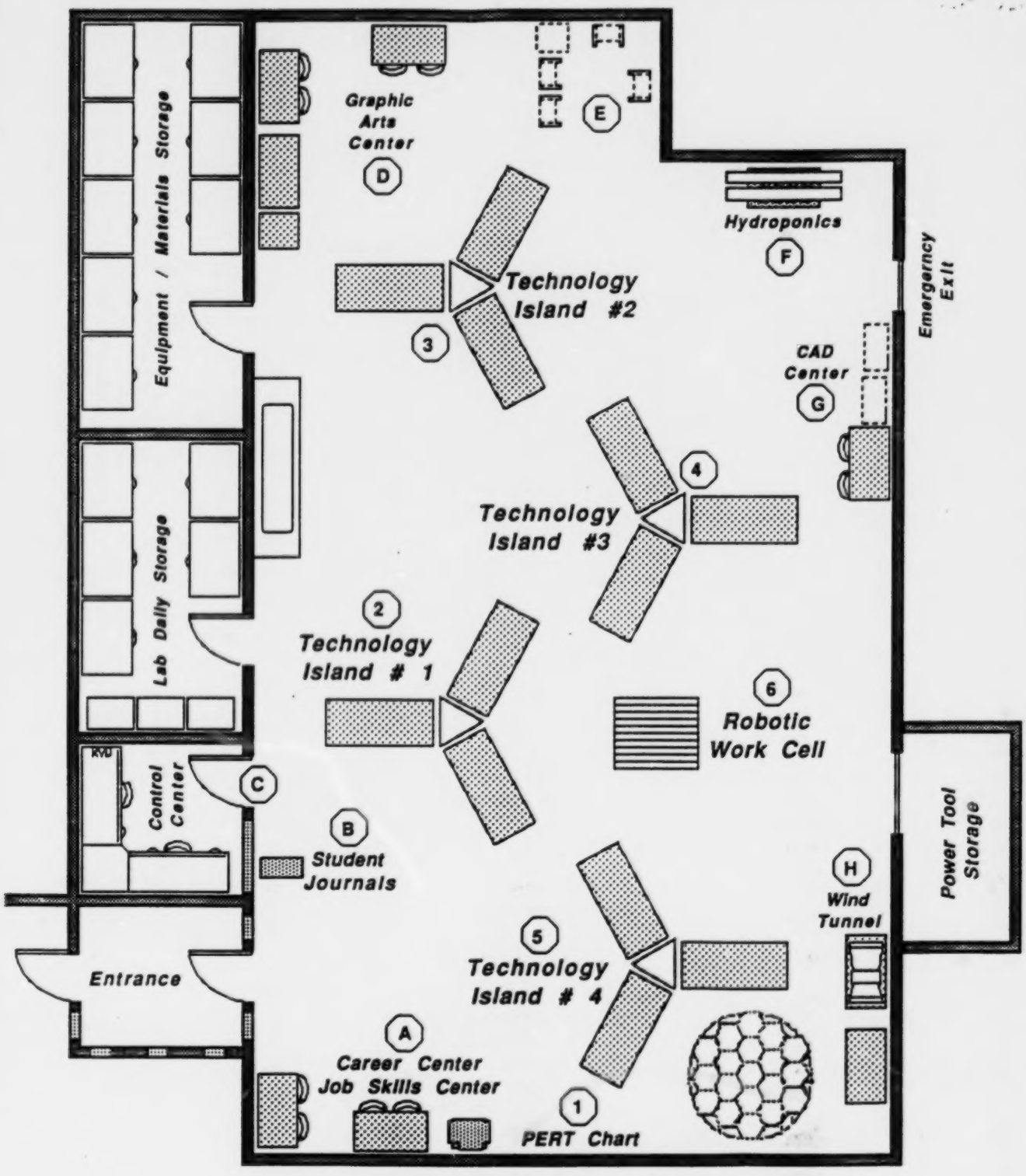
(D) ***Graphic Arts Center*** Students engage in advanced desktop publication, graphic creations, digital animation, and other computer based activities.

(E) ***Research & Development Think Area*** This is a place where students can review new ideas and concepts, and interact with each other on issues.

(F) ***Hydroponics*** Students grow Wisconsin Fast Plants using a hydroponic system and a soil system, then compare results.

(G) ***CAD Center*** Students develop computer aided drawings of buildings, mechanical parts, electronics, products, etc.

(H) ***Wind Tunnel*** Students explore the aerodynamics of objects.



Erie Technology Lab

Erie, Colorado

St. Vrain Valley School District RE-1J